

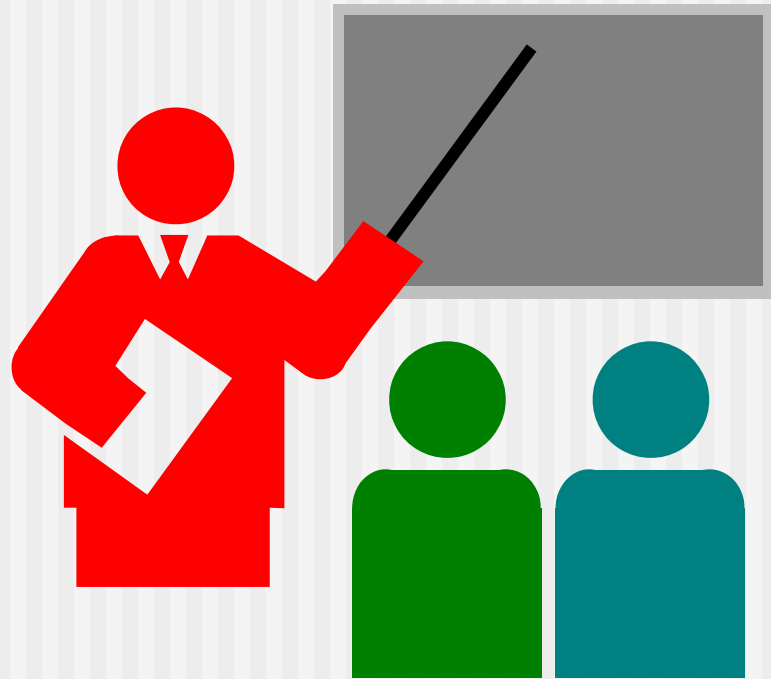
Load Testing

GySgt Brubaker

Learning Objectives

- **TLO**

- **ELO'S**



Load Test Background

- **Secretary of Defense requires Marine Corps to conform with OSHA REGULATIONS**



Load Test Background

- Extracts of OSHA-29 Code of Federal regulations (CFR) 1910 consolidated in **MCO P11262.2**
- Years past, DOD agencies have been more stringent than OSHA



Load Test Background

- **Performed when not required costing:**
 - *Time*
 - *Manpower*
 - *Material*



Load Test Responsibilities/CO's

- **Ensure:**
 - **Inspection**
 - **Testing**
 - **Certifications**
 - **Conducted per MCO P11262.2 and TM'S**
 - **Includes updating 696D's**



Load Test Responsibilities/CG's

- **Designate specific 3rd shops to provide:**
 - **Inspection**
 - **Testing services**
 - **For units without such capability**



Load Test

Responsibilities CO's MCB's

- **Make load test facilities available to:**
- **Tenant/geographically proximate fleet marine force organizations**
- **Pg. 3-3 of MCO 11262.2**

Load Test Responsibilities Operator

- **Assume direct responsibility for equipment when dispatched to them**
- **Includes:**
 - **Safe operation**
 - **Proper use**
 - **PMCS**
 - **Collection of operational data**

Load Test General Information

- **Table 1-1 of MCO P11262.2 lists requirements by items of equipment for:**
 - **Inspection**
 - **Testing**
 - **Certification of load lifting equipment**
 - **Pg 1-7**

	GME	JACK STANDS	HYDRAULIC JACKS	HOISTS	WINCHES	FORKLIFTS	WRECKERS	CRANES	AERIAL PERSONNEL DEVICE	EQUIPMENT PERMANENTLY INSTALLED IN FACILITIES	RETRIEVERS	PAR. REF.
NO ACTION REQUIRED												2005
REQUIREMENT DO NOT FALL UNDER PROVISIONS OF THIS ORDER	●										●	4,2005
PERMANENTLY MARKED W/RATED LOAD CAPACITY		●	●									4
CONDITION INSPECTION				●	●	●	●	●	●		●	1001.3, 2000 2001, 4002.3
HOOK INSPECTION				●	●		●	●			●	2002
WIRE ROPE, FASTENERS, TERMINAL HARDWARE				●	●		●	●			●	2003
HOIST, WINCHES & STRUCTURAL METAL COMPONENTS				●	●		●	●			●	2004
NO LOAD TEST								●	●			4001, 4002.1
LOAD TEST								●	●			1001.4, 4000 4001
STABILITY TEST								●				4000, 4001.3B
PREOPERATION CHECK									●			4002
STABILITY TEST & RANGE OF MOVEMENT									●			4002.4
ANNUAL CONDITION INSPECTION CERTIFICATION				●	●	●	●	●	●		●	1001.4, 1001.8 2000, 2006
LOAD TEST CERTIFICATION								●	●			1001.5
OPERATOR'S DAILY CHECKLIST						●	●	●	●		●	1001.2

Load Test

General Information



- **Conduct condition inspections with scheduled PM's**
- **Use condition inspection record in TM 4700**
- **Pg. 4-9 MCO P11262**
- **Conduct inspection annually if not covered as part of scheduled maintenance.**

USMC No.	Type	Location	Operator Names	Operator License Nos.		
Purpose of Inspection:			Date Started	Date Completed		
Item No.	Item Description	P	F	Insp/ Init.		
1	Bent, cracked, or corroded structural members.					
2	Cracked or corroded welds.					
3	Loose, broken, missing, or deteriorated rivets or bolts.					
4	Inspect all wire rope for wear, broken wires, corrosion, kinks, damaged strands, crushed or flattened sections, condition of sockets, and dead end connections. Check for proper lubrication and evidence of proper inspection of idler sheaves and saddles.					
5	Inspect hooks for cracks, sharp edges, and distortion. Verify disassembly, inspection, and NDT, as applicable.					
6	Inspect all brakes and clutches for proper operation. Spot check components for proper adjustment and acceptable wear.					
7	Check all controls for proper condition and operation.					
8	Check all control components for proper condition and operation.					
9	Inspect all limit switches for condition and proper operation.					
10	Ensure each drum has minimum of two complete wraps of wire rope at lowest working level.					
11	Check load indicators for condition and working accuracy.					
12	Inspect all mechanical equipment which is reasonably accessible for wear, cracks, and alignment.					
13	Inspect, where practical, for worn, defective, or misaligned bearings, bushings, shafts, pins, and gears.					
14	Check components for excessive heat, vibration, noise, and oil leaks.					

Item No.	Item Description	P	F	Insp/ Init.
15	Inspect sheaves for wear, roughness, free-turning, and alignment. Gauge sheave groove, where possible.			
16	Inspect for excessive wear of wheels, tires, rollers, and roller paths or rails.			
17	Inspect for excessive wear of chains and sprockets. Measure chain stretch of load chains.			
18	Verify that correct certified capacity charts or hook load rating data is in view of operator and/or rigging personnel.			
19	Inspect operator's cab for cleanliness and operation of all equipment.			
20	Check machinery house for cleanliness, proper safety guards, warning signs, and storage of tools and equipment.			
21	Check operation of all indicators, warning devices, and lights.			
22	Check for proper type and condition of all fire protection equipment.			
23	Check condition and function of outriggers, pads, boxes, wedges, and cylinder mountings. Check level indicators.			
24	Check center pin nut and steadiment by observing operational behavior during load test.			
25	Check travel, steering, braking, and locking devices for condition and proper operation.			
26	Check radius indicator for accuracy by measuring actual radius in at least two boom positions.			
27	Check pawls, ratchets, and spuds for proper engagement and operation of interlocks.			
28	Inspect tanks, lines, valves, drains, filters, and other components of air systems for leakage and proper operation.			
29	Inspect reservoirs, pumps, motors, valves, lines, cylinders, and other components of hydraulic systems for leakage and proper operation.			
30	Check engines and engine generator sets for proper performance, safety, and system leakage.			
31	Inspect for bent, cracked, corroded, or dented boom members.			

Item No.	Item Description	P	F	Insp/ Init.
32	Check condition of counterweights, ballast, and securing fasteners.			
33	Check all compartments (voids) for water tightness.			
34	Check accuracy of list and trim indicators against design data or previous test data.			

Remarks:

Signature

Date

1. Inspector

2. Test Director

3. Certifying Officer

Load Test General Information

- **Only cranes and aerial devices require load testing**



Load Test General Information

- **Aerial devices are:**
 - **Mechanically**
 - **Hydraulically**
 - **Electrically operated devices used to lift personnel in the air**
- **Scheduled periodic load testing not required**

Load Test General Information

- **Load test prior to initial use:**
 - All newly manufactured
 - Extensively repaired or altered cranes/aerial personnel devices



Load Test General Information

- **ACI all new equipment prior to initial use**
- **New items being fielded will be inspected/tested as part of equipment acceptance inspection**
- **Unless, equipment has current (12 months) certifications**

Load Test General Information

- **Responsibility of organization performing repairs to load test**
- **Prior to returning equipment to owner**



Load Test

General Information

- **Upon receipt of crane/aerial device, CO/OIC will determine if load test has been accomplished by:**
 - **Exam of records**
 - **No certification present, CO/OIC may elect to:**
 - **Not accept**
 - **Accept and load test locally**

Questions?



Questions to Class

Q) Operators assume direct responsibility for equipment:

A) Assigned/dispatched to them

Q) Extracts of safety instructions come from what manual?

A) OSHA-29 Code of Federal Regulations (CFR) 1910

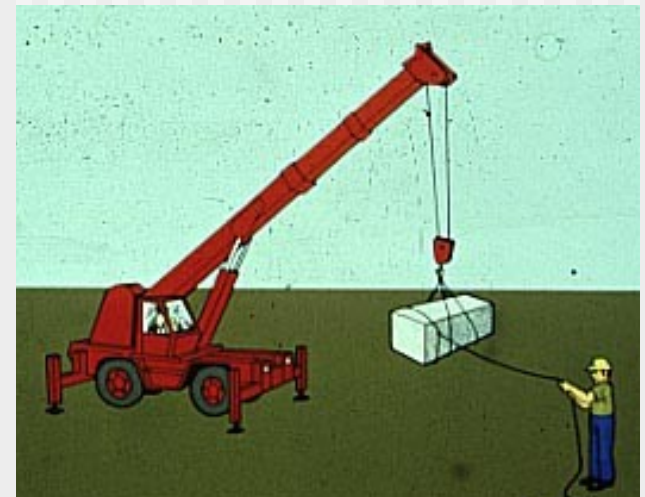
Load Test ACI

■ Purpose

- Ensures overall
- Structural
- Mechanical
- Hydraulic
- Electrical components
- Maintained in a serviceable condition and functioning properly

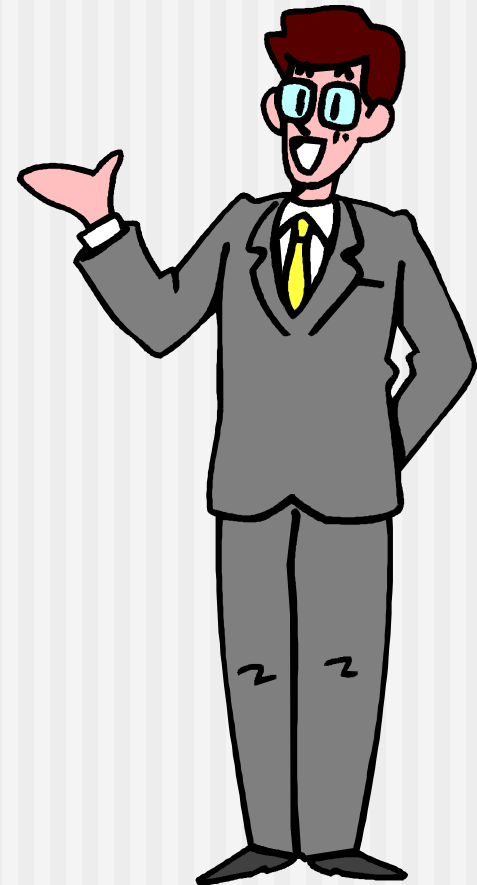
Load Test ACI/Certification

- **Certifying officer:**
 - **Responsible for ensuring safety/reliability of all load lifting equipment**
 - **Designated in writing by CO**
 - **Marine officer or qualified civilian**



Load Test ACI/Certification

- **Marines will posses MOS:**
 - **1310 Engineer**
 - **3510 MT**
 - **2110 Ordnance**
- **Certifying officer will designate -**
 - **Test directors**
 - **Inspection and test personnel**



Load Test ACI/Certification



- **Certifications based on:**
 - **Condition inspection (ACI)**
 - **Availability of load test certification**

Load Test ACI/Certification



- **All contracts for purchase of -**
 - **New cranes**
 - **Aerial personnel devices**
- **Include requirement for manufacturers load test certification to accompany vehicle on delivery**

Load Test ACI/Certification



- **Load testing required if lifting portion of crane/aerial devise has been -**
 - **Repaired**
 - **Altered**

Load Test ACI/Certification



- Repairs to truck portion of crane will **NOT** require load testing
- Outriggers considered part of lifting portion of crane

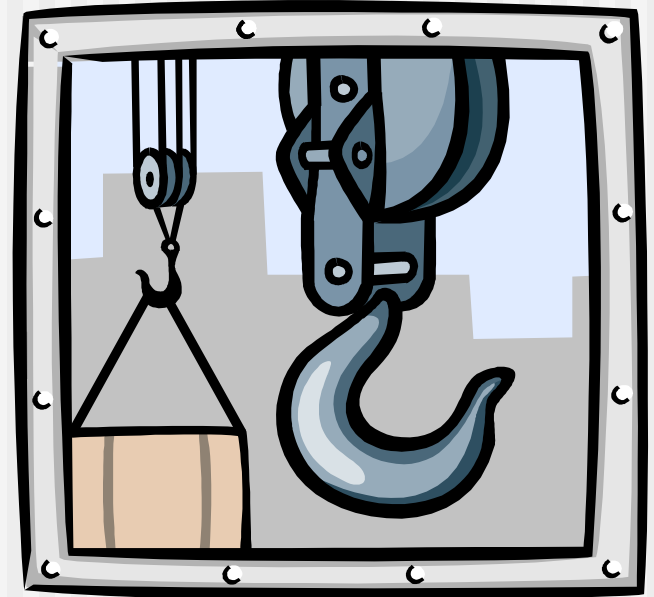
Load Test ACI/Certification

- **Contracts for rebuilt or significantly repaired mobile cranes/aerial devices must contain:**
- **Load test requirement/certification clause**
- **Depots required to furnish same**



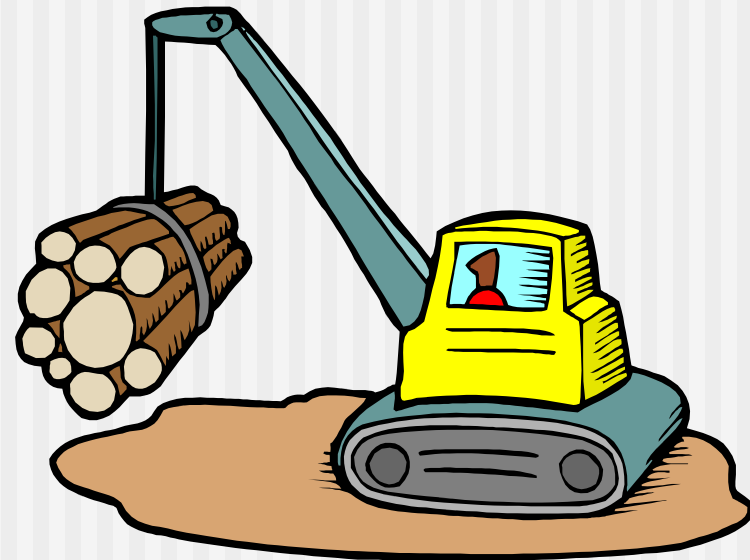
Load Test ACI/Certification

- **Certification officers qualified at appropriate Marine Corps school or -**
- **Labor department approved civilian run school**
- **Example of civilian school**



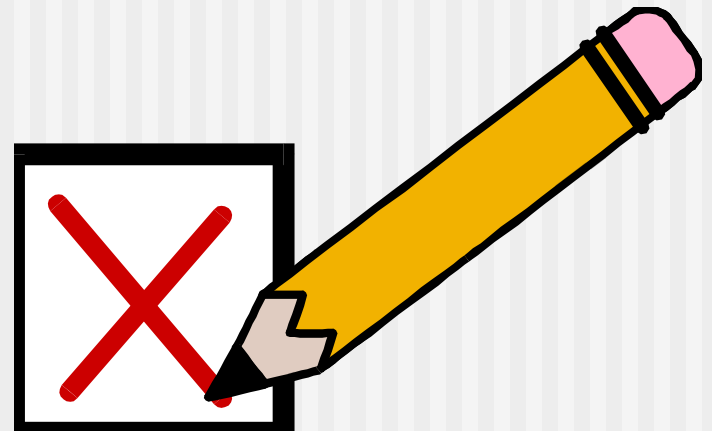
Load Test ACI/Certification

- **Crane Institute of America**
- **Maitland, FL 32751**
- **(407) 875-6969**
- **(800) 832-2726**
- **Fax (407) 330-0660**
- **craneinstitute.com**



Load Test ACI/Certification

- **ACI and load test forms signed by:**
 - **Inspector**
 - **Test director**
 - **Certifying Officer**
 - **Pg 4-11**



Load Test ACI/Certification

- **Frequency**

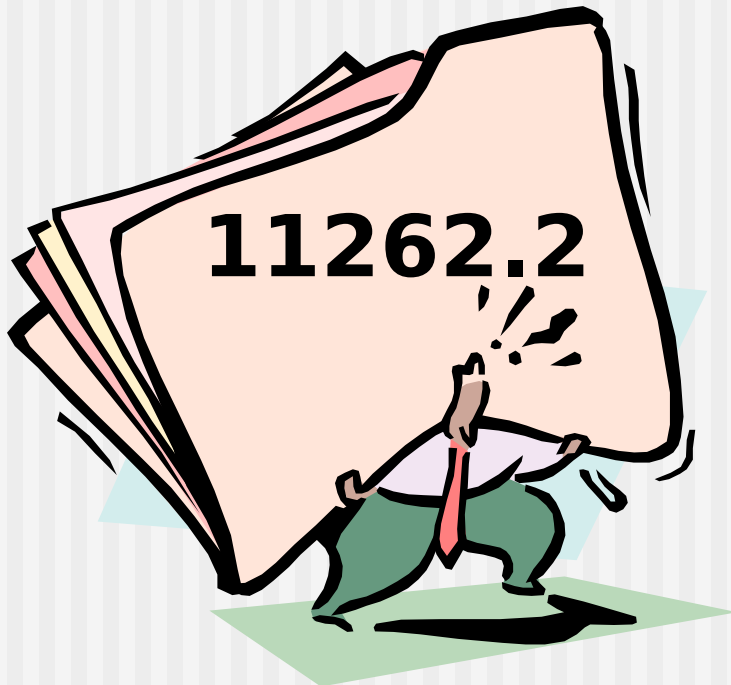
- **All load lifting equipment**
- **Condition inspected annually**



Load Test ACI/Certification

- **Waivers**

- Requirements of MCO P11262.2 waived for following reasons



Load Test ACI/Certification

■ **Waivers**

- **1) Extended combat conditions**
- **2) Administrative storage per MCO P4790.2**
- **3) Administrative storage will not extend beyond a 2 year period**
- **Does not apply to admin deadline or low usage**

Load Test ACI/Certification

- 4) Peacetime, CG's of 4th Division Wing Team authorized waiver for 1 year period
- Maintain waivers 696's



Load Test ACI/Certification

- 4th DWT will not be allowed to go without inspection, testing, or certification for 2 consecutive years

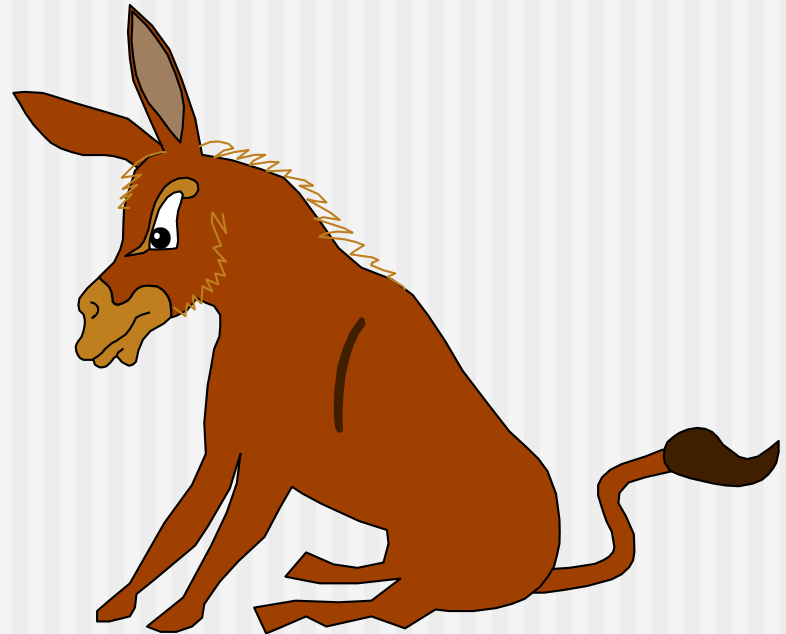


Load Test ACI/Certification

- **Marking**

- **Stenciled**
- **Clearly visible to operator**
- **Certification data indicating test status**
- **Example:**
- **Cap. 50,000 lbs certified 10 NOV 1776**

Questions?

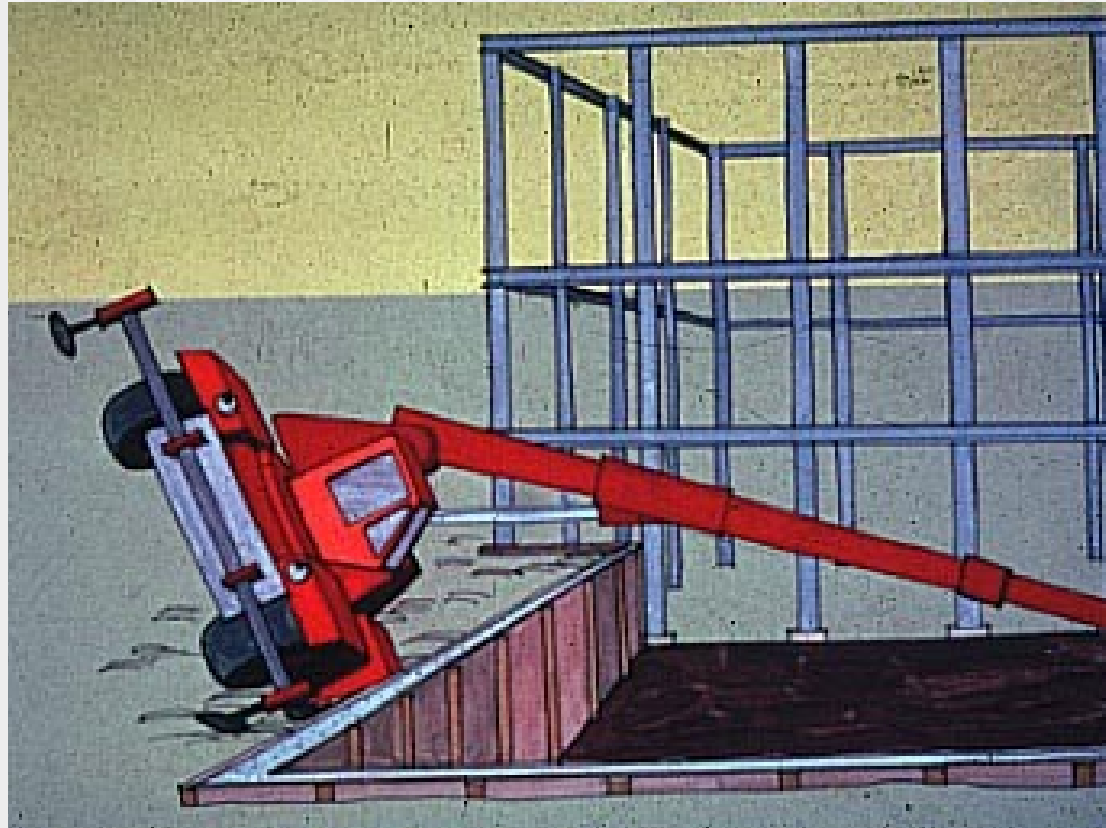


Questions to Class

- **Q) Mandatory that rebuild cranes contain a:**
- **A) Load test requirement clause**
- **Q) Waivers for admin storage will not extend beyond:**
- **A) 2 year period**

Load Test _{ACI}

- What does an ACI consist of?



Load Test ACI

- **Addition to inspections required by:**
 - **TM'S**
 - **Commercial manuals**
 - **Perform the following**



Load Test ACI

- **CHECK -**

- **Mechanical controls**
- **Entire control mechanism**
- **For contamination by leaking lubricants or foreign matter**

Load Test ACI

- **Check hydraulic system**
 - **Seals and hoses**
 - **Lines and fittings**
 - **Pumps and valves**
 - **For deterioration, leaks, and wear**

Load Test ACI

- **Check mast and carriage including forks and chains for:**
 - **Cracks**
 - **Broken welds**
 - **Distortion**
 - **Improper fit**
 - **Excessive wear**

Load Test ACI (Forks)

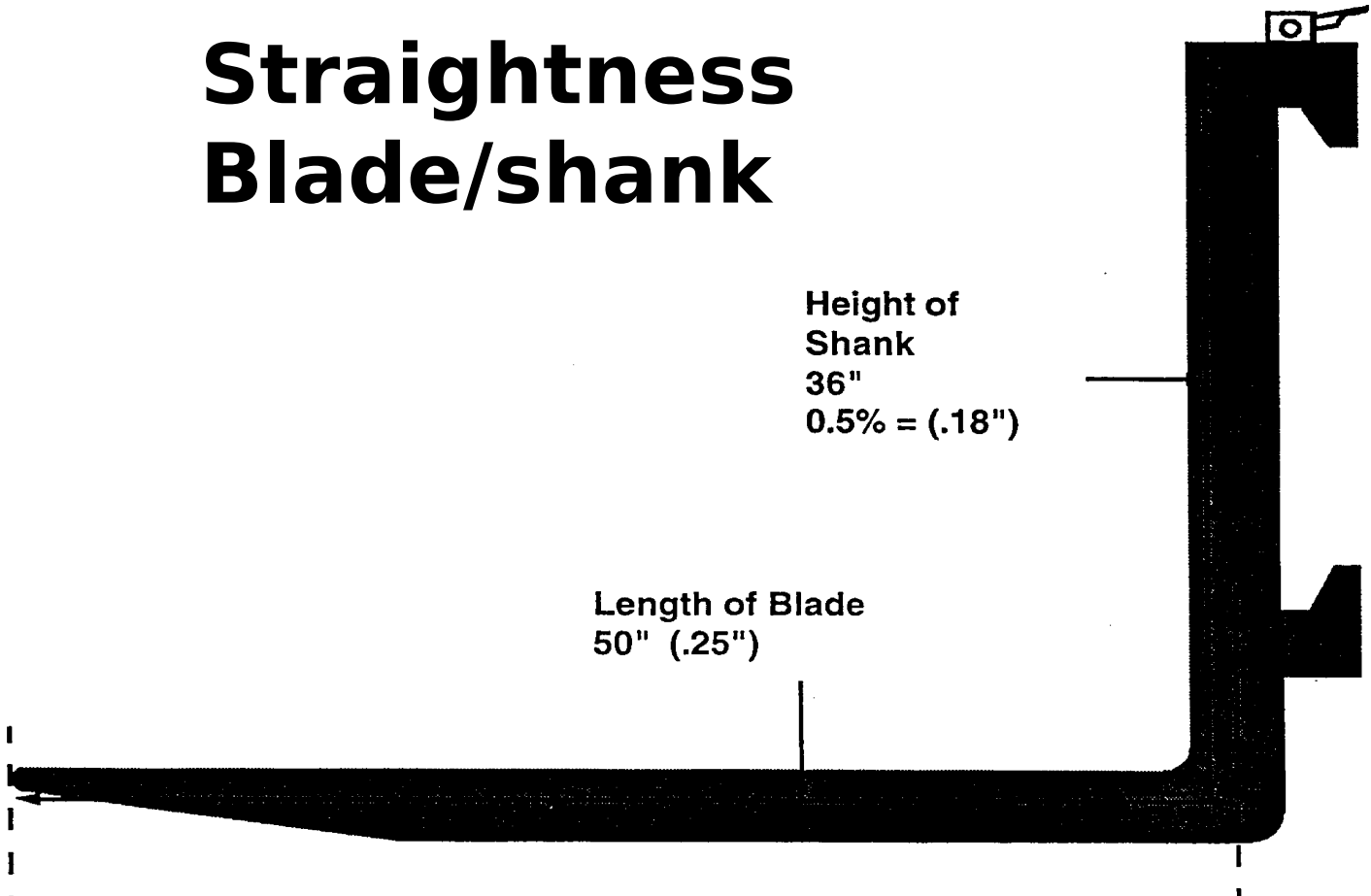
- **Straightness of blade/shank**
 - **Deviation from straightness exceeds 0.5% of length of blade and/or height of shank**
 - **Fork shall not be returned to service until repaired**

Load Test ACI (Forks)

Straightness Blade/shank

Height of
Shank
36"
 $0.5\% = (.18")$

Length of Blade
50" (.25")



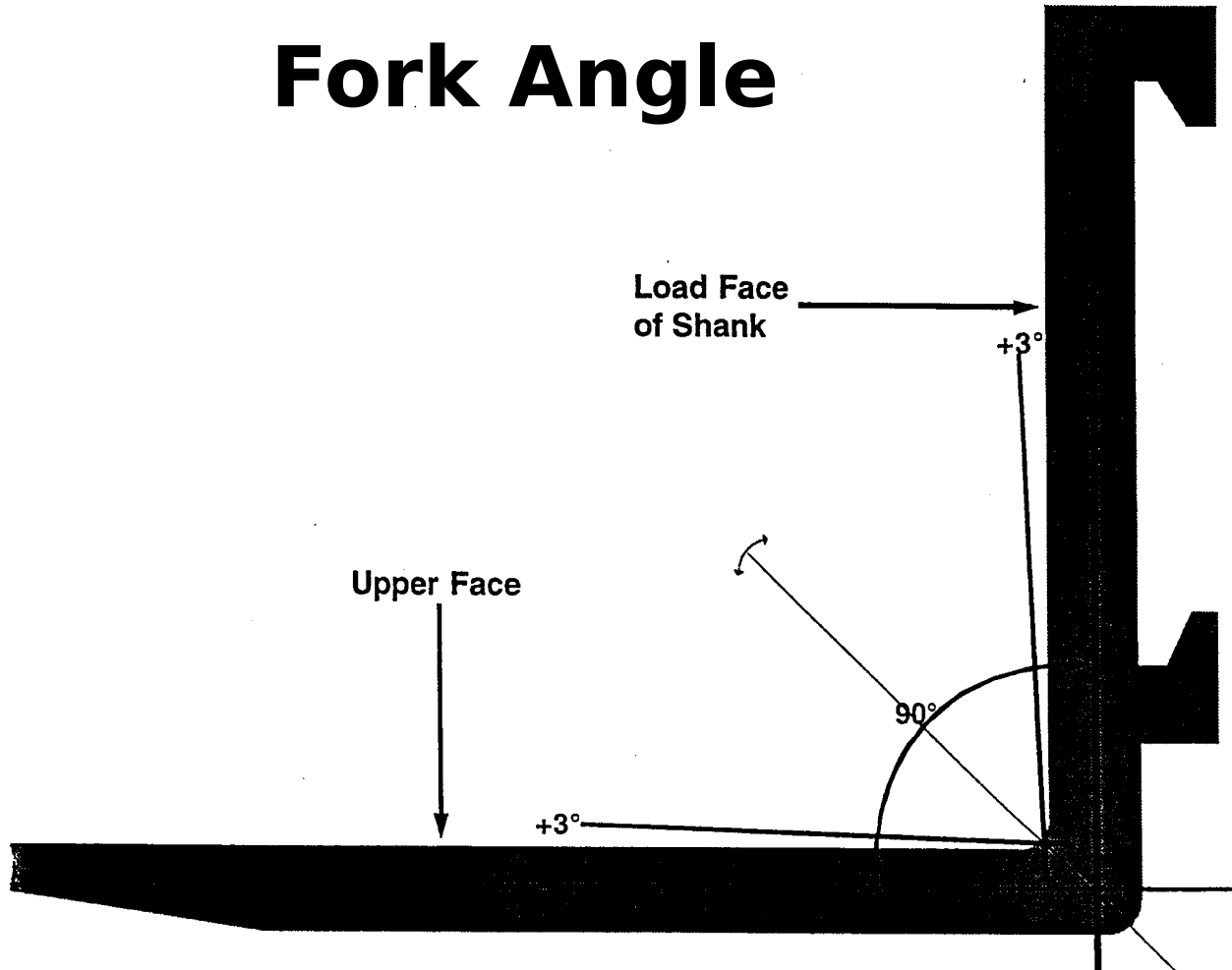


Load Test ACI (Forks)

- **Fork angle -**
 - **Fork that has deviation greater than 3 degrees from original specification**
 - **Not returned to service until angle reset and tested**

Load Test ACI (Forks)

Fork Angle

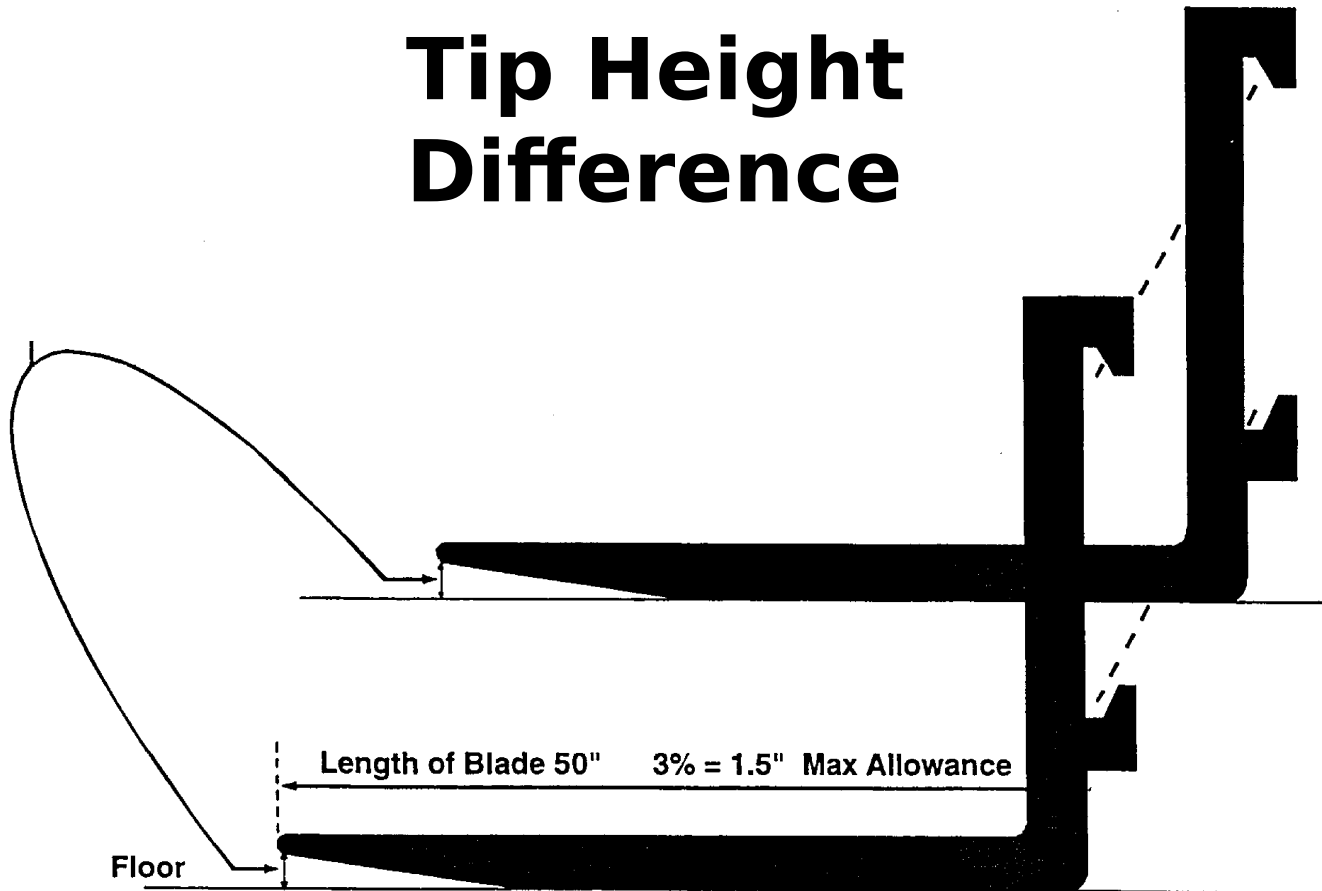


Load Test ACI (Forks)

- **Difference of height of fork tips**
 - **Exceeds 3% of length of blade**
 - **2.16" for 72" forks**
 - **1.2" for 40" forks**
 - **Set of forks not returned to service until repaired**

Load Test ACI (Forks)

Tip Height Difference



Load Test ACI (Forks)

70"



40"

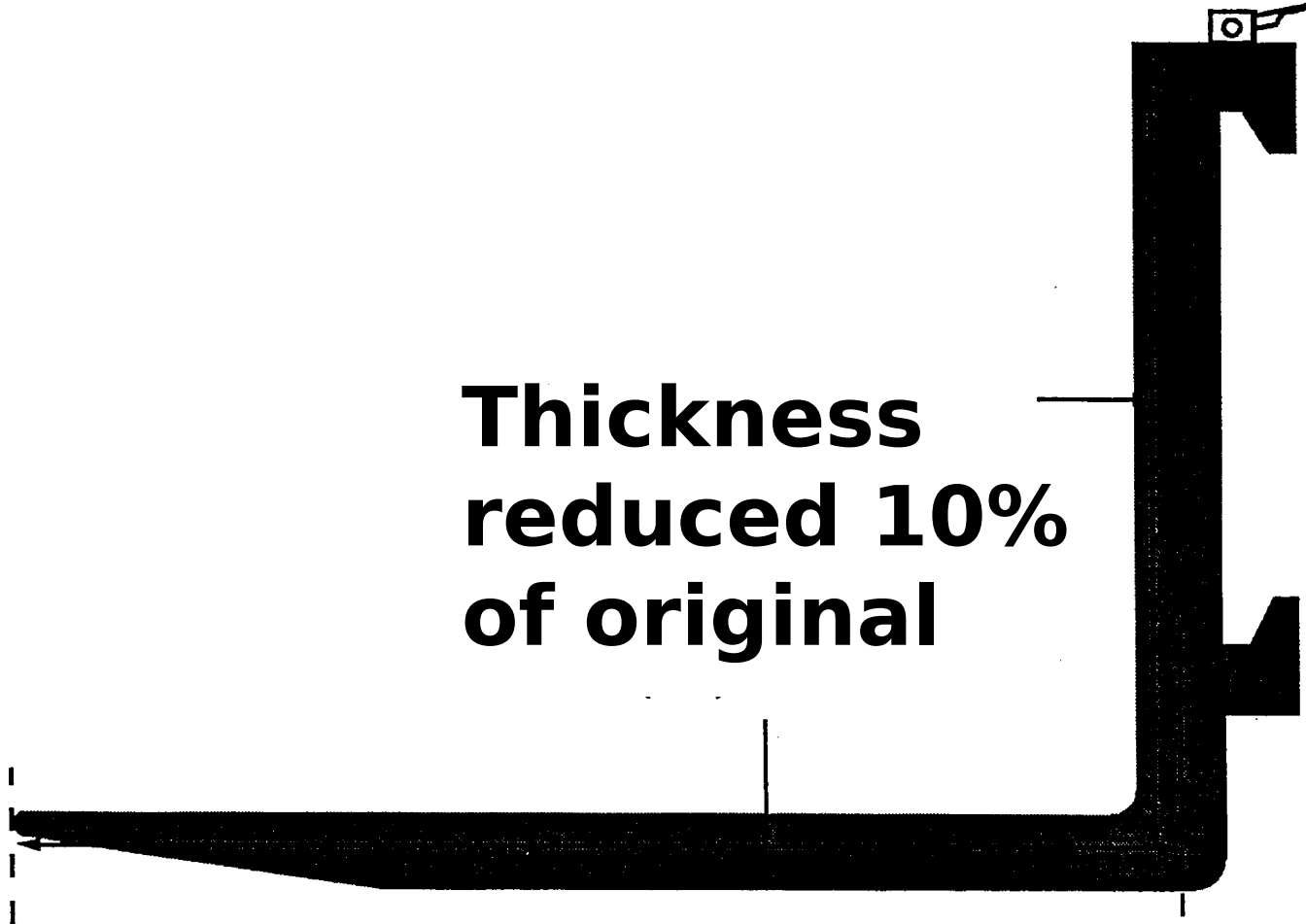


Load Test ACI (Forks)

- **Fork blade/shank wear**
 - **Thickness reduced 10% of original thickness**
 - **Fork not returned to service**

Load Test ACI (Forks)

**Thickness
reduced 10%
of original**



Load Test ACI (Forks)

- **Manufacture of forks**
 - **Decide if forks can be repaired**
 - **Only one authorized to perform repairs**

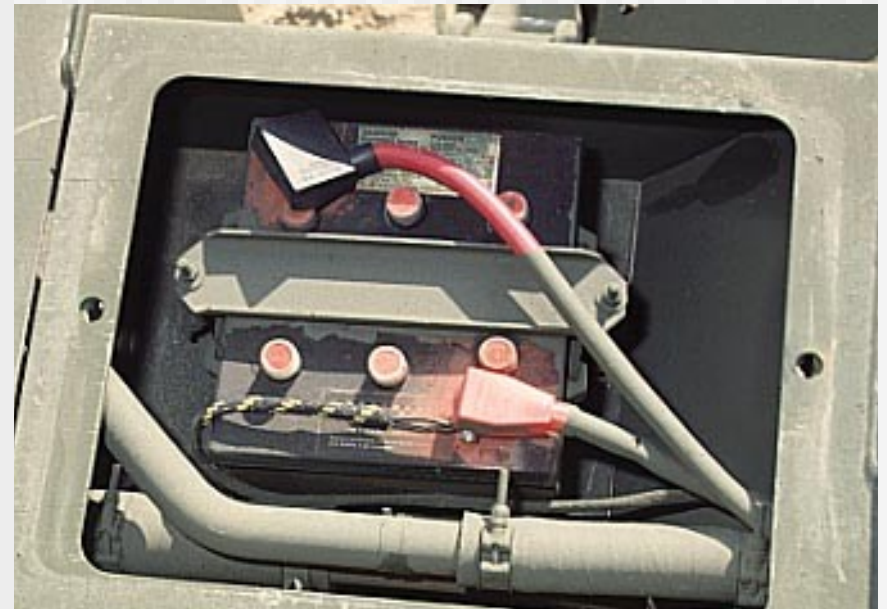
Load Test ACI

■ Check

- Brake and steering systems for defective moving parts to include
- Seat switches
- Parking brakes
- Brake interlock switches

Load Test ACI

- Check electrical, and diesel systems for:
 - Malfunction
 - Excessive deterioration
 - Dirt or moisture accumulation



Load Test ACI

■ Check

- Protective motor control circuit devices
- Battery terminals
- Battery compartment insulation
- Compartment covers
- Emergency switches

Load Test ACI

- **Ensure:**

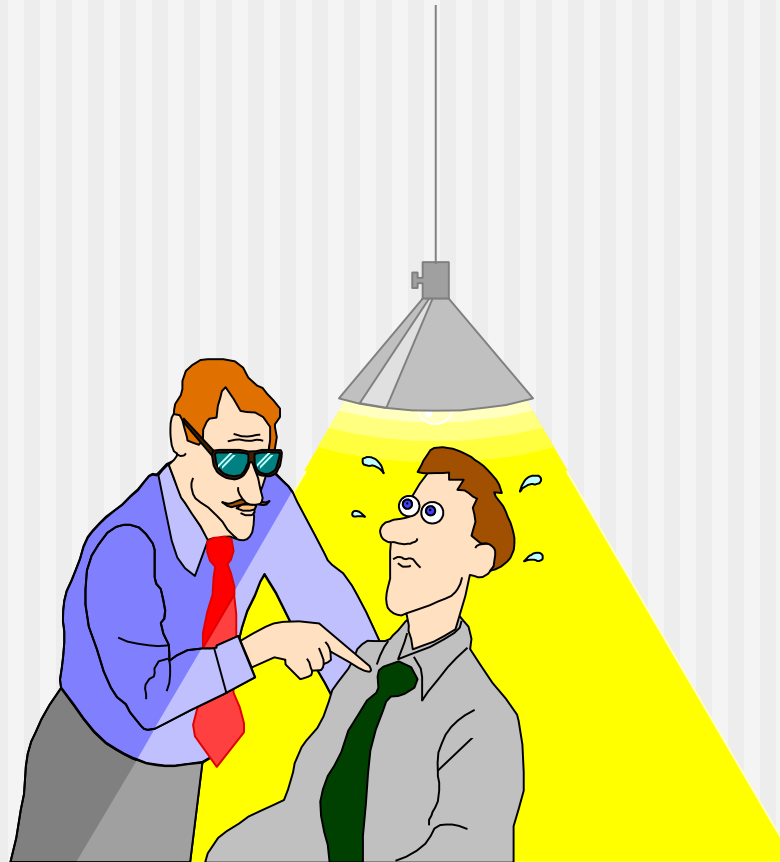
- **Electrical cables are installed correctly to prevent damage**
- **Batteries are securely fastened in place**
- **Battery compartment provides ample VENTILLATION**
- **Keep equipment free of excess oil and grease**

Load Test ACI



- **All deficiencies will be corrected prior to load testing**

Questions?



Questions to Class

Q) Fork with deviation of ____ from original spec not returned to service until reset and tested

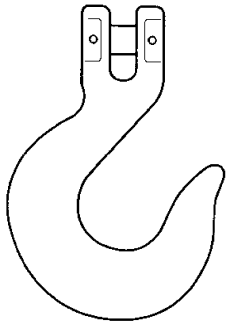
A) 3 degrees

Q) Inspection performed in addition to those required by TM's

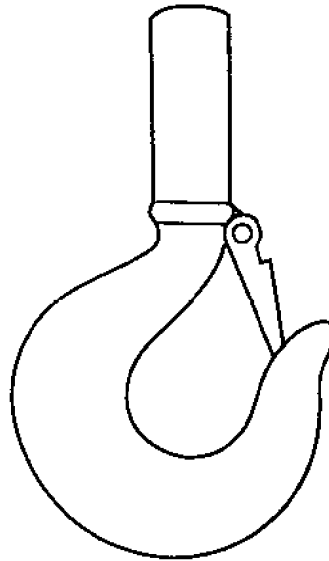
A) ACI

Load Test Hook Inspection

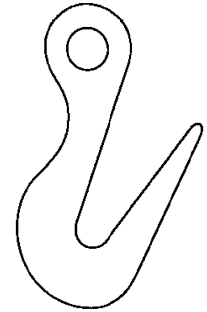
Clevis Hook



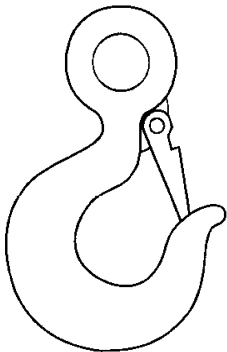
Shank Hook



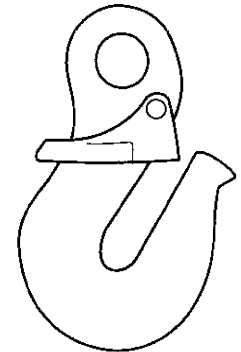
Sorting Hook



Eye Hook

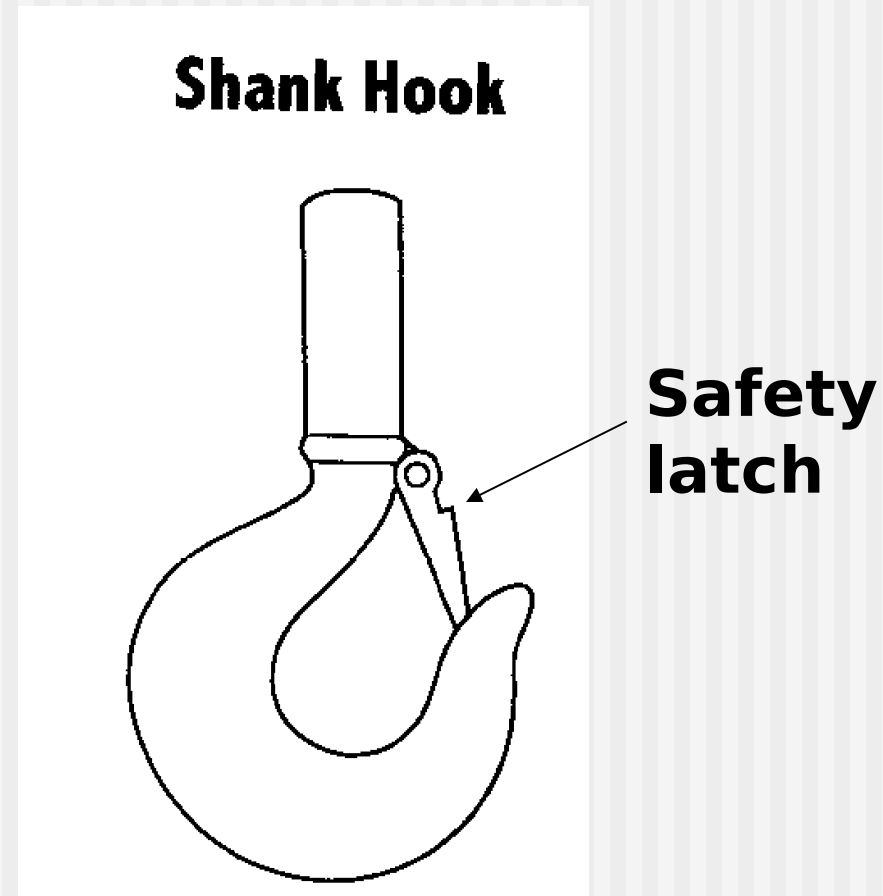


Grab Hook



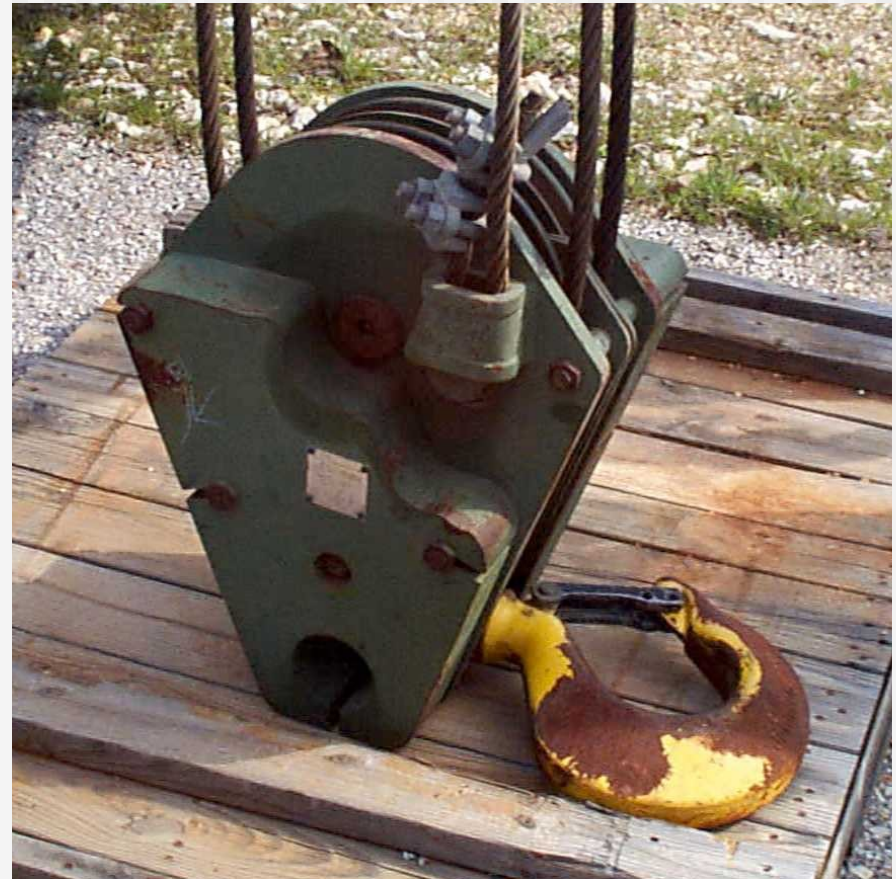
Load Test Hook Inspection

- **Hooks Inspected annually**
 - Swivel and pin wear
 - Cracks and gouges
 - Safety latch operation and condition



Load Test Hook Inspection

- Hooks shall not be painted.
 - Hides cracks and gouges
 - Remove paint before ACI



Load Test Hook Inspection

- Cracks and gouges **parallel** to contour
 - Remove by surface abrasion
- Cracks and gouges **cannot be removed**
 - Discard

Load Test Hook Inspection

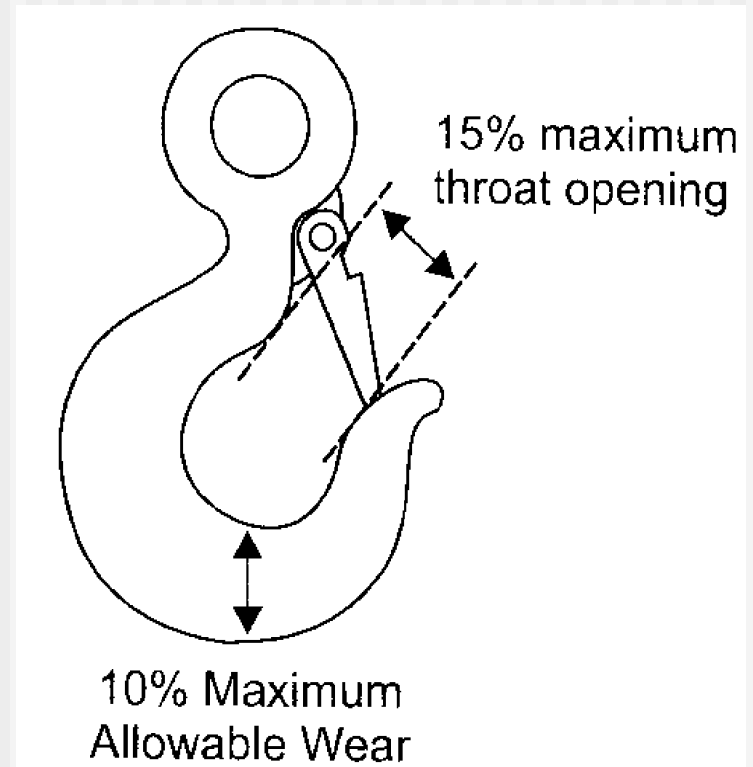
- Cracks and gouges **transverse** to contour
 - Evaluate for retention or disposal
- Defects in unstressed portion do not affect strength

Load Test Hook Inspection

- **Do not correct hook deficiencies with**
 - **Heat**
 - **Welding**

Load Test Hook Inspection

- Normal wear
- Removal of cracks and gouges
- Reduction of 10% or more of original dimensions
- Discard hook



Load Test Hook Inspection

- **Hooks visually bent or twisted**
 - **Discard**
- **Never attempt to straighten bent or twisted hooks**

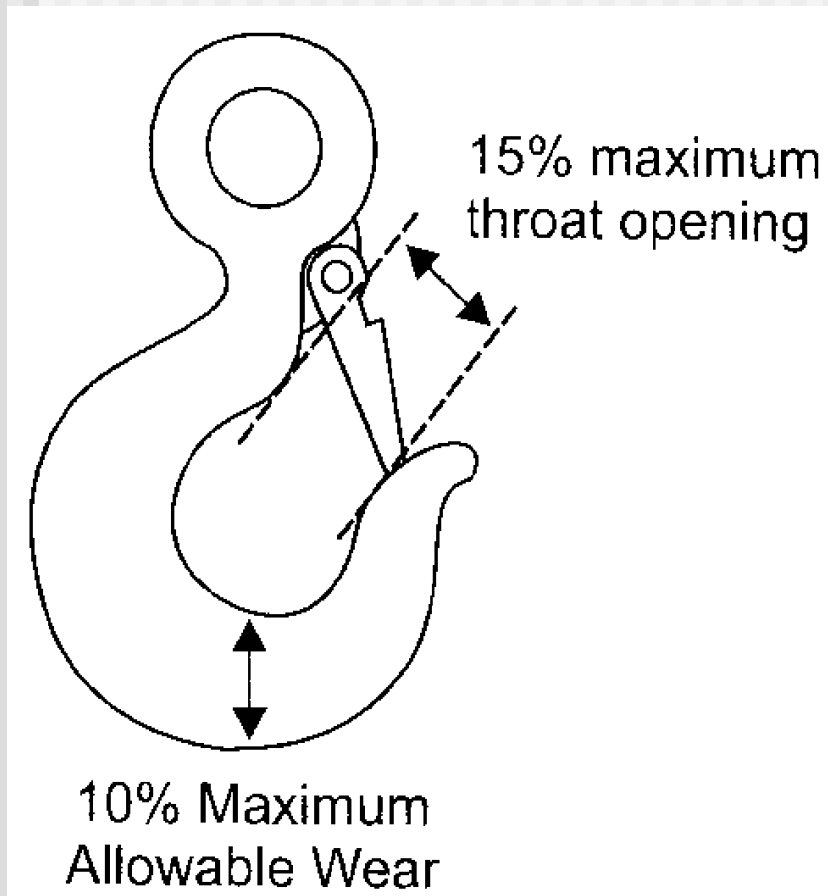
Load Test Hook Inspection

- **Hook Throat Spread**
 - Measured upon receipt
 - Utilize tram points
 - **Base dimension recorded in “Remarks” of 696D for life of hook**

Load Test Hook Inspection



Load Test Hook Inspection



- **Increase in throat opening 15% or more of base measurement**
- **Discard**

Load Test Hook Inspection



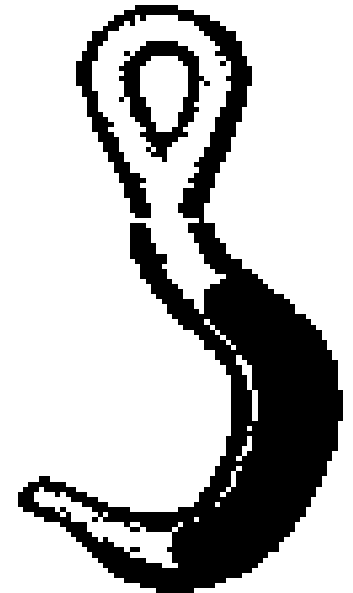
SAFE



WATCH



REFORGE



DISCARD

Load Test Hook Inspection

- **Hook Block Inspection and Nondestructive Test (NDT)**
- **Inspect annually**
 - **Hook**
 - **Retaining nut**
 - **Bearings**

Load Test Hook Inspection

- **Hook and retaining nut**
 - **Thread wear**
 - **Corrosion**



Load Test Hook Inspection

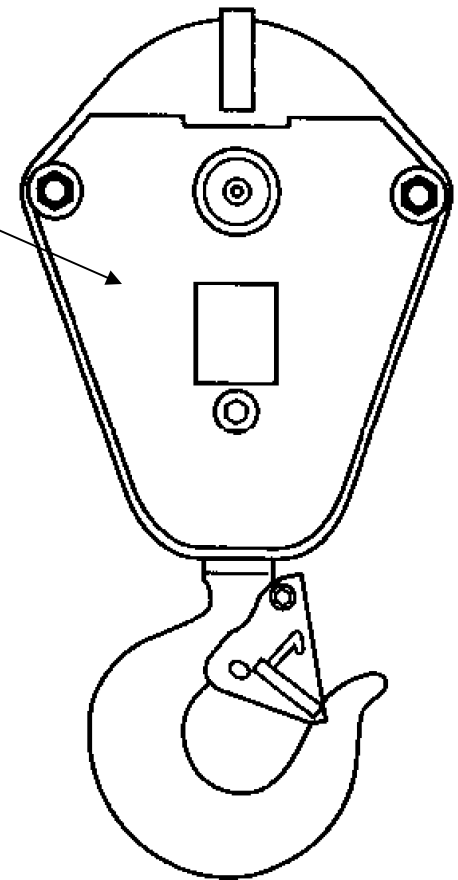
- **Block bearing plate**

- Cracks
- Wear

- **Bearings**

- Wear
- Free rotation

Side plate



Load Test Hook Inspection

- **Hook and retaining nut assembly**
 - **Nondestructively tested for structural defects**
- **Hook NDT valid for 5 certification periods**

Load Test Hook Inspection

- **Hook inspection +**
- **NDT =**
- **Crane certification date**

- **NDT performed during load test**

Load Test Hook Inspection

- **5 years after crane certification**
- **Hook with said crane entire time subject to new:**
 - **Non**
 - **Destructive**
 - **Test**

Questions?



Questions to Class

Q) Two types of hook block inspections and their intervals?

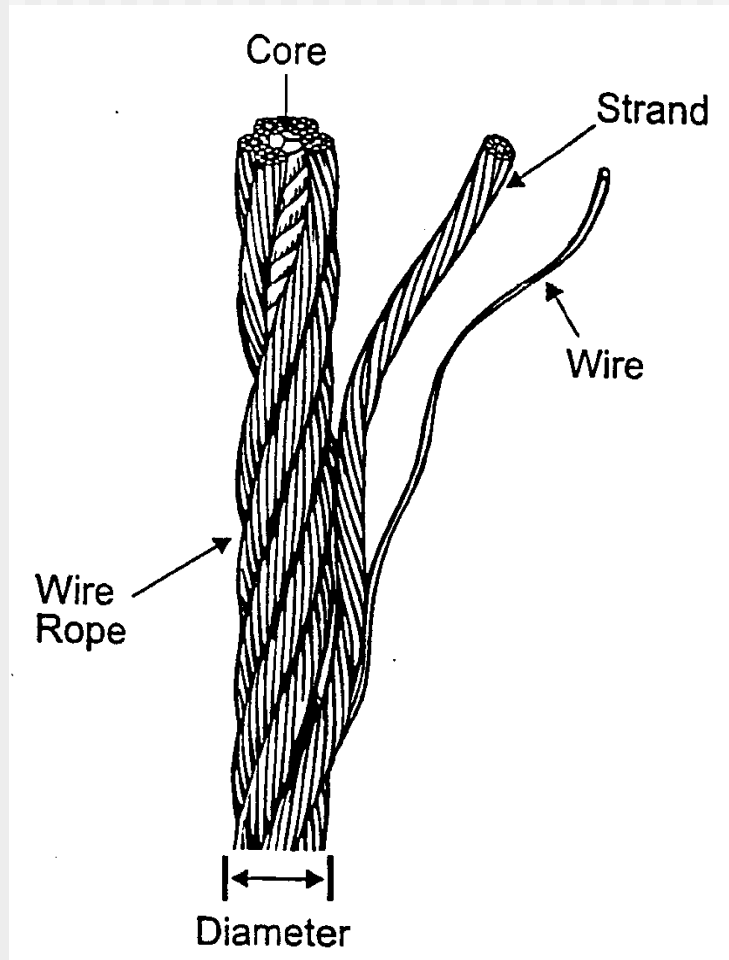
A) Hook inspection/NDT

A) Annually/Every 5 years

Q) If a hook is visually bent or twisted

A) Discard

Load Test Wire Rope



Inspection

Load Test Wire Rope

- **Remove dressing from areas exposed to:**
 - **Maximum wear**
 - **Exposure**
 - **Abuse**

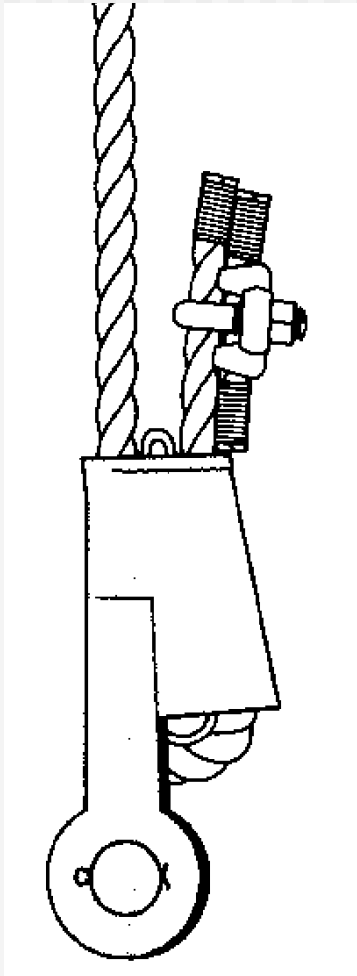
Load Test Wire Rope

- **Inspect rope for:**

- **Crushing**
- **Kinks**
- **Corrosion**
- **Broken wires**
- **Proper lubrication**



Load Test Wire Rope



- **Check for wear and corrosion on wire rope -**
 - **Sockets**
 - **Eyes**
 - **Swivels**
 - **Trunnions**
 - **Securing hardware**

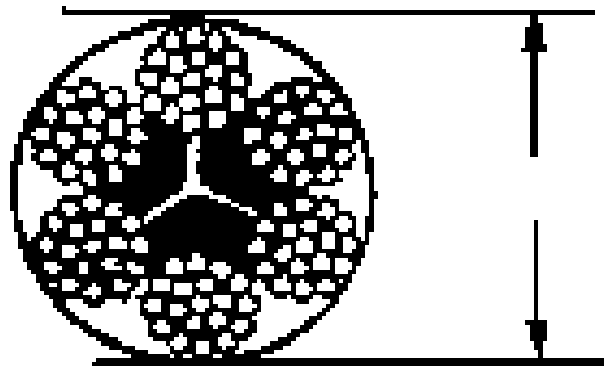
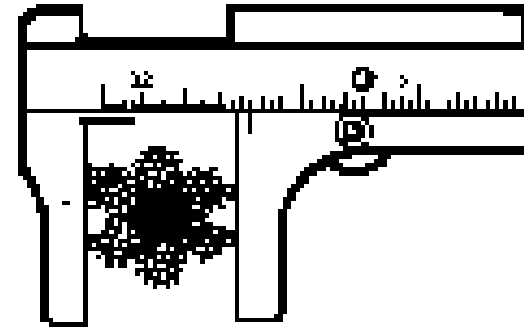
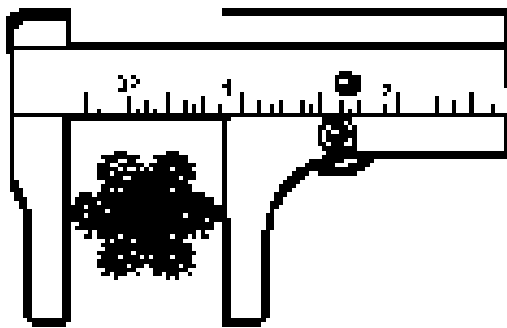
Load Test Wire Rope

- **Drum end fittings**
 - **Disconnect/disassemble**
 - **Visible damage or deterioration**

Load Test Wire Rope

- **Remove damaged portions, or replace exceeding following:**
 - **Kinks or crushed sections**
 - **Flattened sections - less than 5/6 of original diameter**
 - **Wear - not to exceed 30% original diameter of outside individual wires**

Load Test Wire Rope



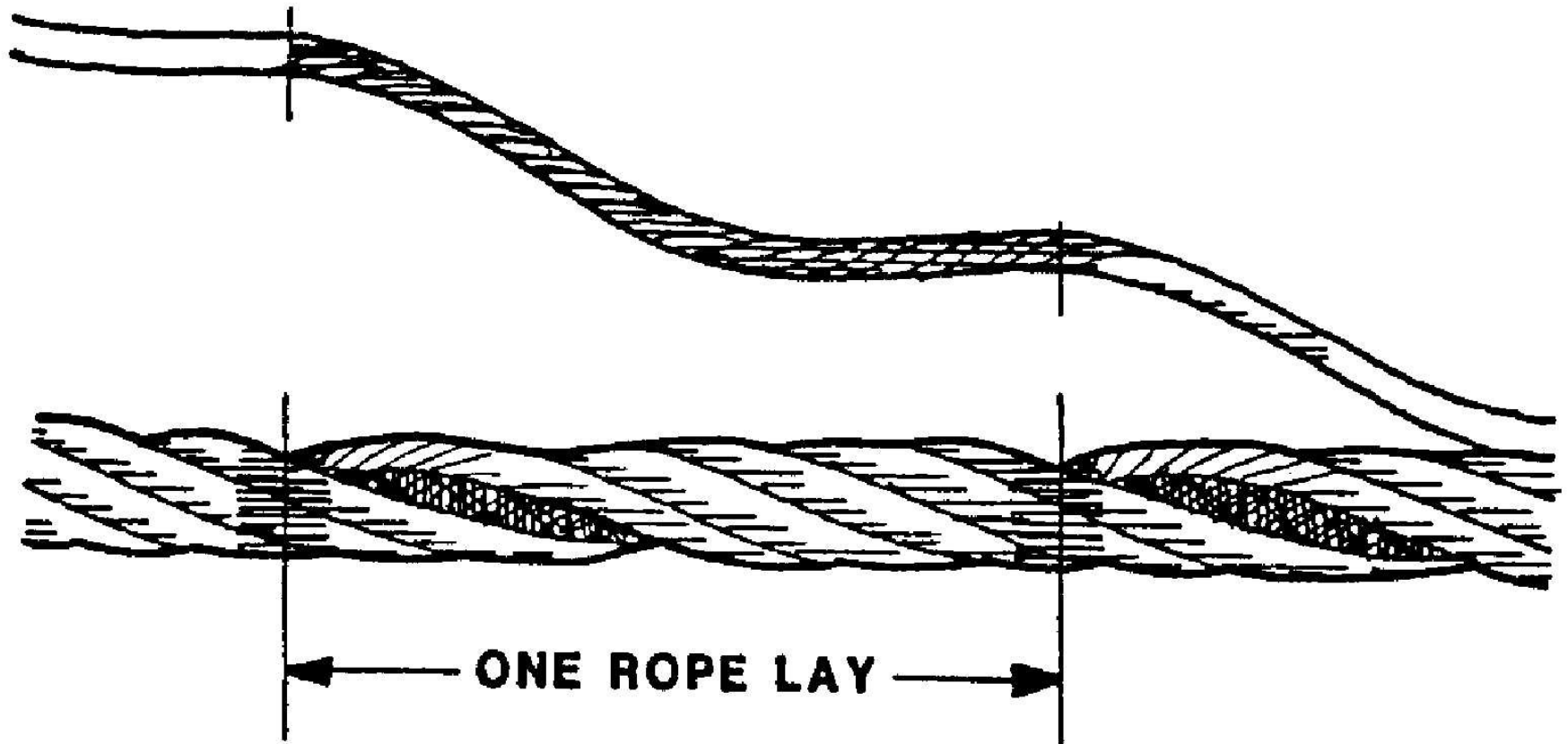
Load Test Wire Rope

- **Running ropes**
 - **Number of broken/torn wires is 6 or more randomly distributed broken or torn wires in one lay**
 - **3 broken wires in one strand in one lay**
- **Replace end connection if one or more broken wires adjacent to end connection**

Load Test Wire Rope

- **Standing, guy, and boom pendant ropes**
 - **More than 2 broken wires in one lay in sections beyond the end connection or:**
 - **1 or more broken wires at an end connection**

Load Test Wire Rope



Load Test Wire rope

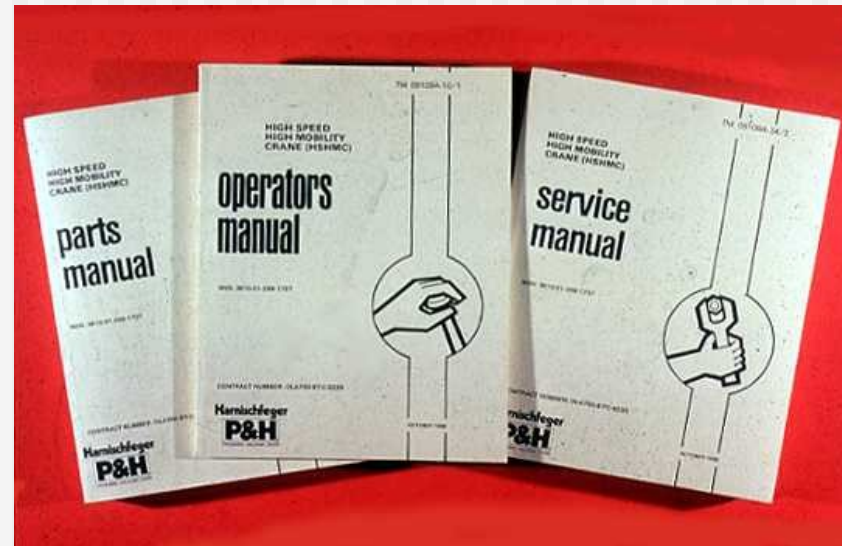
- **Loss in diameter**
 - **Not to exceed 10 % of nominal diameter**
 - **3/64" for 3/4" wire rope**
 - **1/32" for 1/2" wire rope**

Load Test Wire Rope

- **Accumulation of defects**
 - Judgment of the inspector creates an unsafe condition
- **Rated capacity**
 - Rated capacity of replacement wire rope per manufacturer

Load Test Hoist/Winches

- **Operation check**
 - Per appropriate TM
 - Where checklist is not included in TM
 - Following inspections conducted as a minimum



Load Test Hoist/Winches

- **Inspect all:**
 - **Control mechanisms for maladjustment**
- **Inspect all:**
 - **Control mechanisms for excessive wear of components**
 - **Contamination by lubricants**

Load Test Hoist/Winches

- **During ACI inspect for following:**
 - Proper marking
 - Evidence of mishandling/damage
 - Excessive wear on brake and clutch system linings, pawls and ratchets
 - **Rope REEVING per TM**
 - Inspect sheaves for cracks, wear, and wire rope imprint

Load Test Hoist/Winches

- **Frames**

- **Check for bends**
- **Distorted sections**
- **Broken welds**
- **Excessive corrosion**
- **Loose bolts or rivets**

Load Test Recording

- **Recording ACI**
 - Utilize form in MCO P11262.2
 - Pg. 4-9
- **Recording load test**
 - Utilize form in MCO P11262.2
 - Pg. 4-12

Load Test Recording

- **ACI filed in 696D**
- **Retained until completion of next inspection**

Load Test Recording

- **Load test certification form filed in 696D**
- **Retained until successful completion of next inspection/test**
- **Load test certification which documents the completion of the NDT'S retained until completion of next NDT**

Load Test Recording

- **Date of NDT**
 - **Annotated in “ remarks”
section of 696D**

Questions?



Questions to Class

Q) What is the wire rope rejection on wear?

A) 30% of outside individual wires

Q) Loss in diameter?

A) Not to exceed 10% of nominal diameter (pg. 2-5)

Load Test Facilities

- **Large, level hardstand**
- **DEADMAN strong enough to withstand at least 150% of areas largest mobile crane**
- **Calibrated SR-4 LOADCELL, or equivalent**
- **Capacity of measuring 150% of areas largest mobile crane**
- **Calibrated weights heavy enough to be used in load tests**

Load Test Facilities



Load Test Facilities



Load Test Facilities

- **Camp Pendleton, CA**
- **Barstow, CA**
- **Possess well-designed DEADMAN/load lifting measuring devices**
- **Other locations in outline**

Load Test Facilities

- **All tests are overload tests**
- **Items of Marine Corps equipment shall not be used for load testing weights**

Questions?



Questions to Class

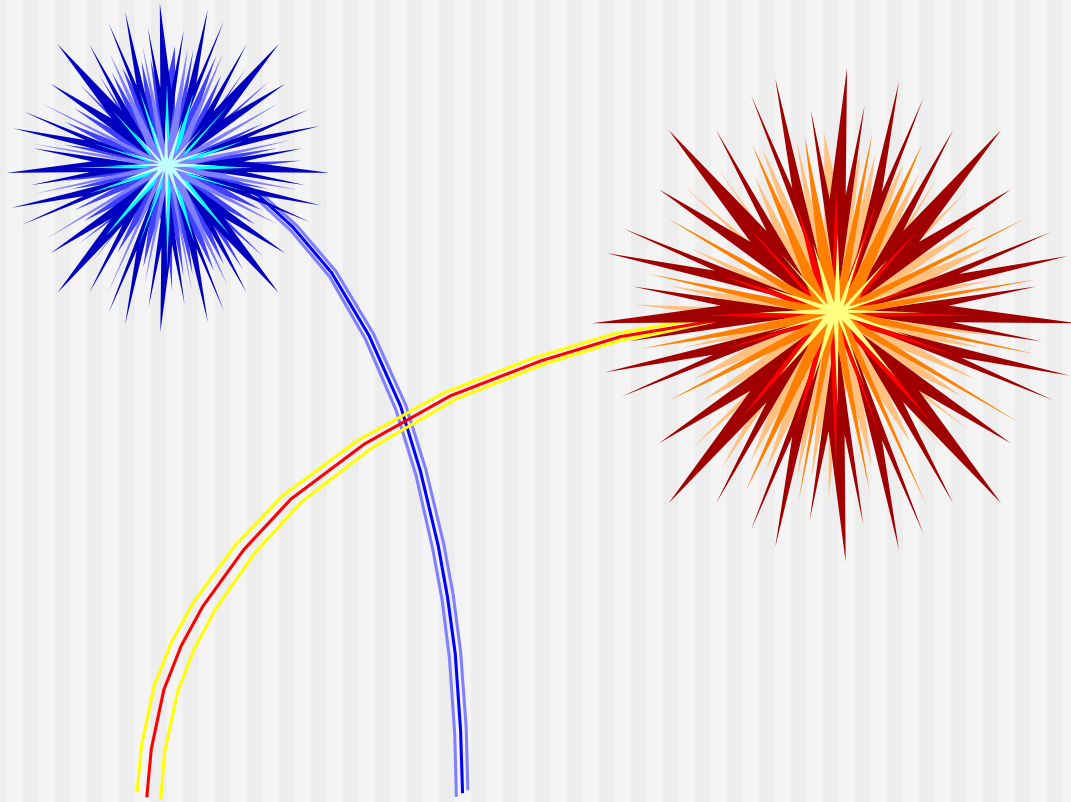
Q) How strong should a DEADMAN be for load test?

A) 150% of areas largest crane capacity

Q) What items of MC gear can be used for load testing?

A) None

Break???



Load Test No-Load Test

- **Extend outriggers**
- **Level crane**



Load Test **No-Load Test**

■ **Hoist**

- **Raise/lower hook through full working range**
- **Run hook block into ATB**
- **Run hook block past ATB using bypass switch**

Load Test **No-Load Test**

■ **Boom**

- **Raise/lower through full working range**
- **Raise/lower into ATB**
- **Raise/lower past ATB using bypass switch**
- **Extend/retract**
- **Check radius by actual measurement**

Load Test

- **Consists of two parts:**
 - **Maximum load test**
 - **Stability test**

Load Test Max Test

- **Level crane**
- **2 to 4 degrees boom deflection**
- **110 % rated capacity**
- **Hold for one minute**
- **Repeat test once more**

Load Test Max Test



Load Test Max Test



Load Test Stability Test

- Any load off load chart below black solid line
- Weights above line, structural
- Weights below line, stability
- 360 degrees
- On outriggers

Load Test Stability Test



Load Test Stability Test

- **Check radius by actual measurement**
- **2 to 4 degrees boom deflection**
- **2 to 4 inches above ground**
- **Swing 360 once**

Load Test Stability Test



Load Test Stability Test



- No more than one outrigger off deck at one time
- Test complete

Load Test Stability Test



Questions?



Questions to Class

Q) How do you confirm proper radius?

A) By actual measurement

Q) What is the max capacity of a load test?

A) 110%

Load Test Aerial Personnel Device

- **Sequence of events**
 - **ACI**
 - **No-Load test**
 - **Load test**

Load Test Aerial Personnel Device

- **Load Test**
 - **Conducted with vehicle not attached to any artificial base**
 - **Outriggers down**
 - **Utilize ground level controls**
 - **No personnel allowed to ride in platform**

Load Test Aerial Personnel Device

- Platform loaded with twice rated working load
- Exercised through full working range
- Both horizontal and vertical
- Rotate 360 degrees minimum 15 minutes

Questions?



Questions to Class

Q) How much weight is used to test aerial personnel devices?

A) Twice rated working load

Q) While testing aerial personnel device, turntable is rotated a minimum of?

A) 15 minutes

FOR OUR 1316's



BREAK !!!

